



NOAA Arctic Report Card

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Co-editors (with Jim Overland, NOAA PMEL) of the NOAA Arctic Report Card and the Arctic Chapter in the NOAA State of the Climate Report (published in BAMS)

A satellite map of the Arctic region, showing the Arctic Ocean and surrounding landmasses. The map is used as a background for the text.

KEY POINTS

- There is ample observation-based evidence that the Arctic is under stress due to climate warming.
- In view of projections of further warming, expect summer sea ice loss to continue.
- Change is occurring throughout the Arctic environmental system.
- Spreading the word is critical.

A satellite map of the Arctic region, showing the Arctic Ocean and surrounding landmasses including North America, Europe, and Asia. A red line traces a path along the coast of North America and into the Arctic Ocean.

Spreading the Word

- **Education and outreach for a broad community are critical.**
- **Knowledge and understanding empower people and enable informed policy- and decision-making.**



NOAA Arctic Report Card

A Web-based tool describing the effects of climate change on the Arctic

Objective: Provide clear, reliable and concise information on recent environmental conditions in the Arctic relative to historical records.

Arctic Report Card



Arctic Report Card: Update for 2010

Tracking recent environmental changes

[Home](#) [Atmosphere](#) [Sea Ice](#) [Ocean](#) [Land](#) [Greenland](#) [Biology](#)

Return to previous Arctic conditions is unlikely

Record temperatures across Canadian Arctic and Greenland, a reduced summer sea ice cover, record snow cover decreases and links to some Northern Hemisphere weather support this conclusion

Arctic Report Card 2010



 Atmosphere	 Biology	 Greenland
 Sea Ice	 Ocean	 Land

Red boxes: Consistent evidence of warming.
Yellow boxes: Many indications of warming.

Atmosphere

Arctic climate is impacting mid-latitude weather, as seen in Winter 2009-2010

Sea Ice

Summer sea ice conditions for previous four years well below 1980s and 1990s

Ocean

Upper ocean showing year-to-year variability without significant trends

Land

Low winter snow accumulation, warm spring temperatures lead to record low snow cover duration

Greenland

Record setting high temperatures, ice melt, and glacier area loss

Biology

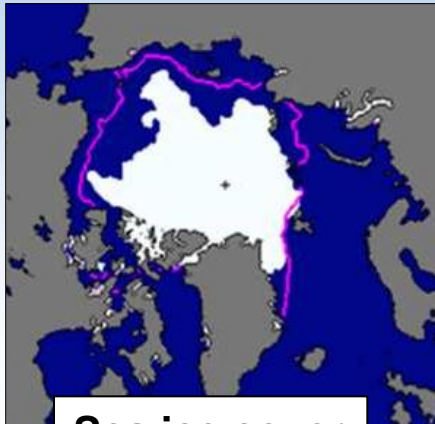
Rapid environmental change threatens to disrupt current natural cycles

[About the Report Card](#)

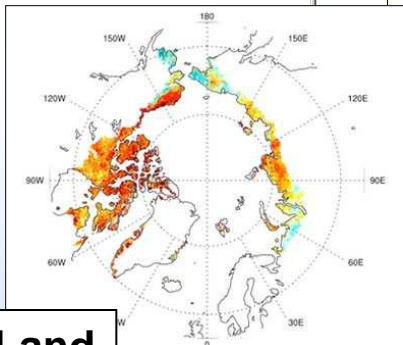
[Printable Handout](#) :: [Executive Summary](#) :: [Full Arctic Report Card \(PDF\)](#)
[NOAA Arctic Theme Page](#)

Arctic Report Card

Update for 2010



Sea ice cover



Land

Arctic Report Card: Update for 2010
Tracking recent environmental changes

Home Atmosphere Sea Ice Ocean Land Greenland Biology

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Atmosphere
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Sea Ice
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Ocean
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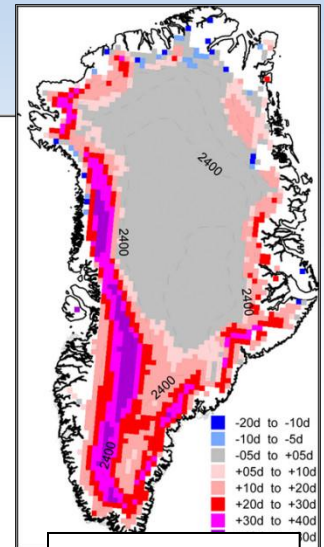
Land
Low winter snow accumulation, warm spring temperatures lead to record low snow cover duration

Greenland
Glacier area loss and ice edge retreat

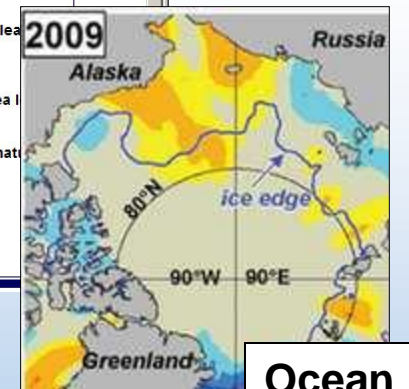
Biology
Polar bear population decline

Jan to Dec: 2009

Atmosphere



Greenland



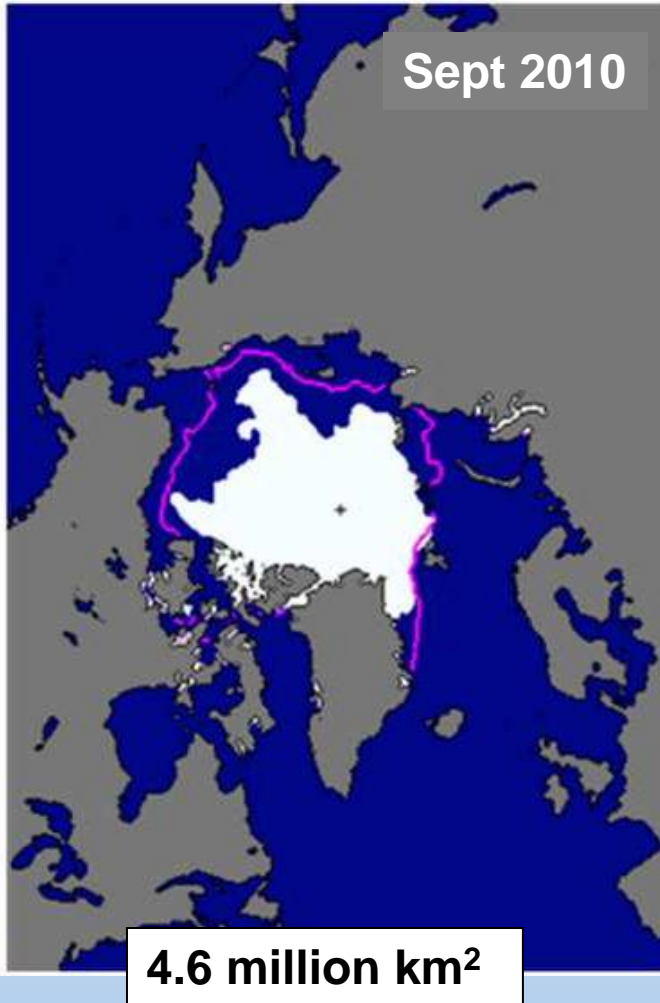
Ocean



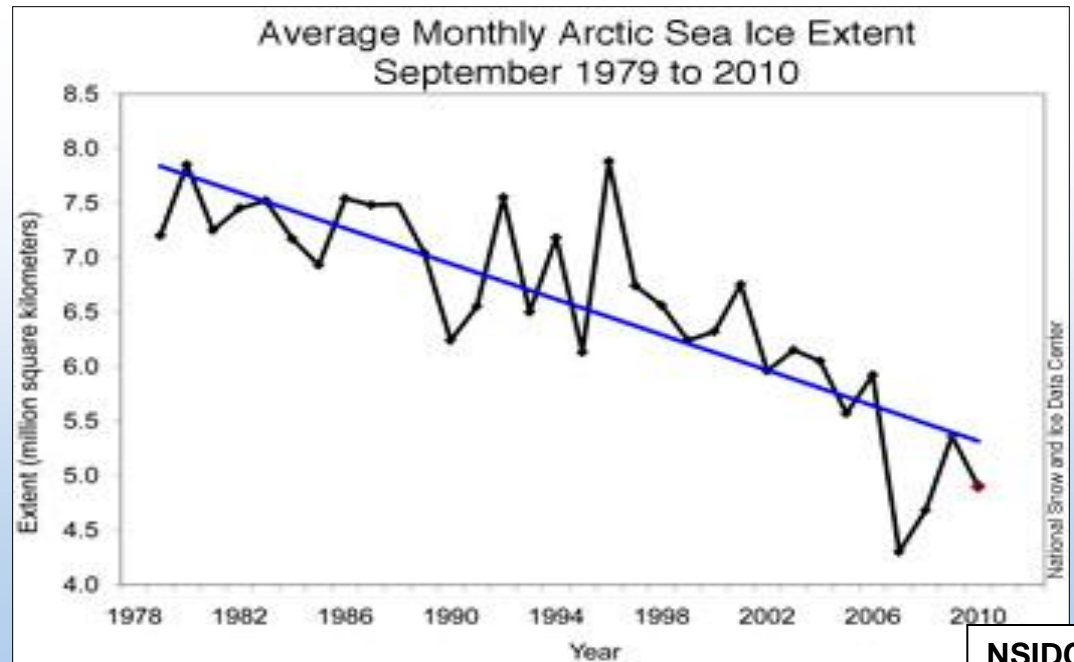
Biology

SEA ICE COVER

Minimum Extent: September

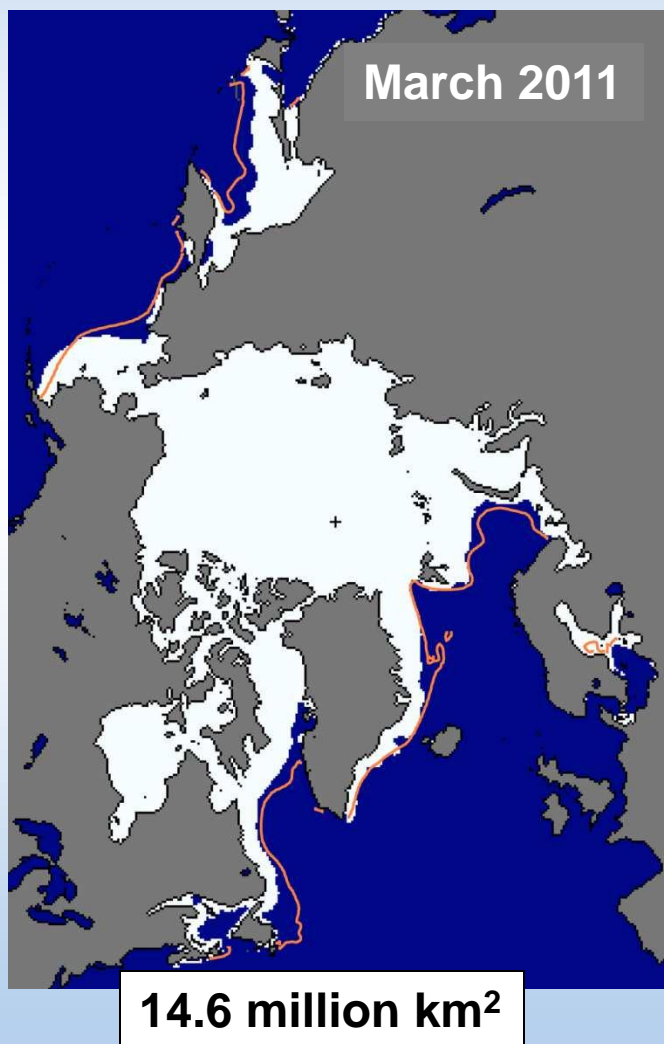


- Downward trend: -11.5 % per decade
- 2007: Dramatic decrease in extent
- 2010: 3rd lowest in satellite record
- 31% below 1979-2000 average
- Some recovery; still relatively small

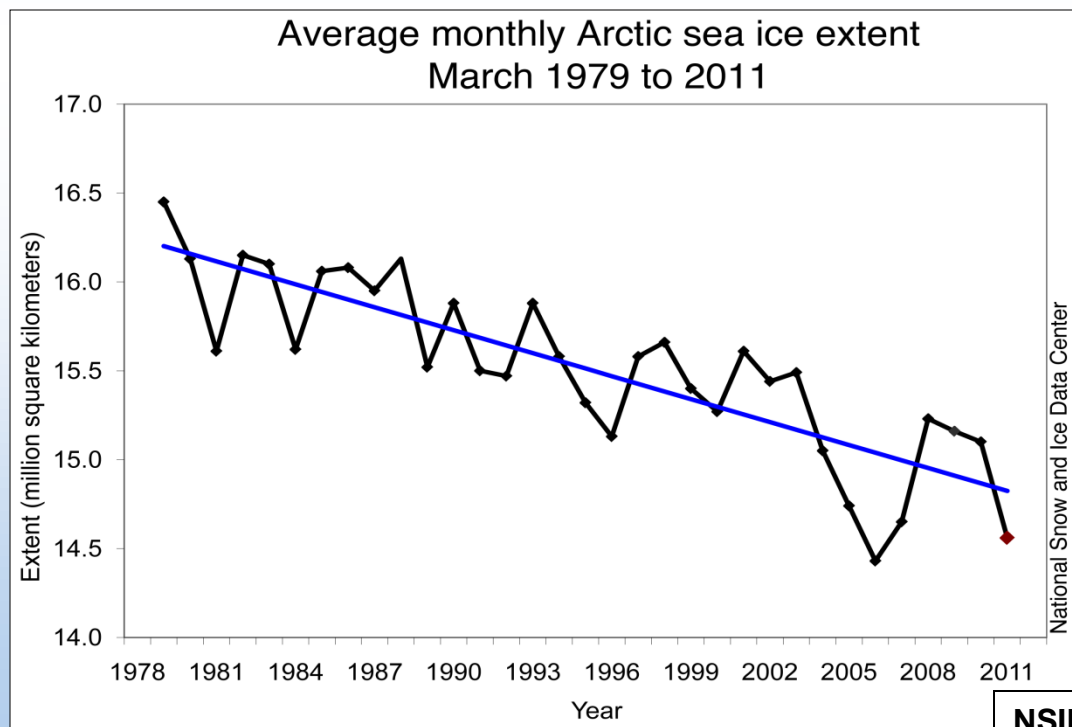


SEA ICE COVER

Maximum Extent: March



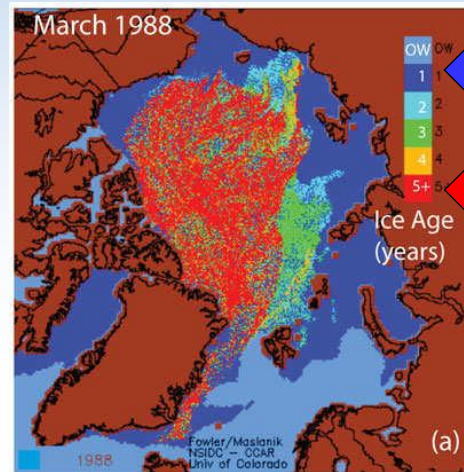
- Downward trend: -2.7 % per decade
- 2nd lowest on record
- Much less pronounced than summer



SEA ICE AGE

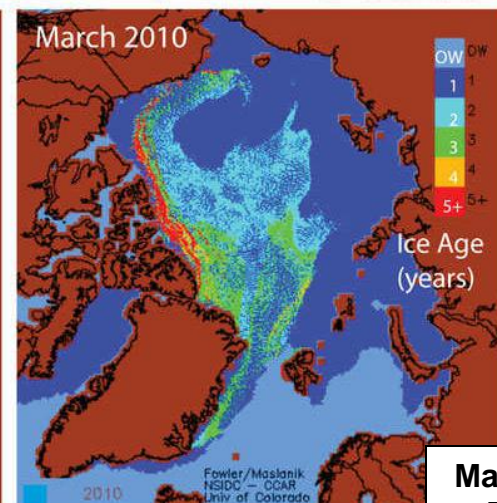
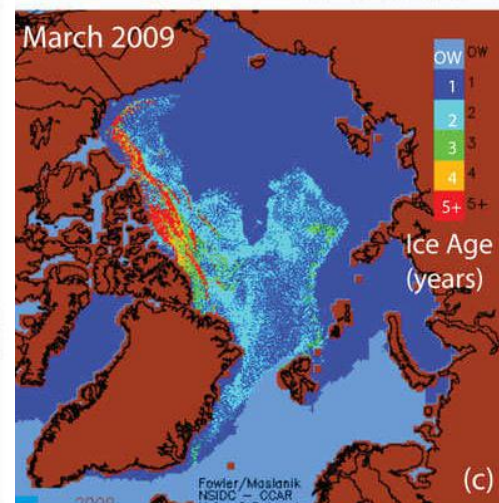
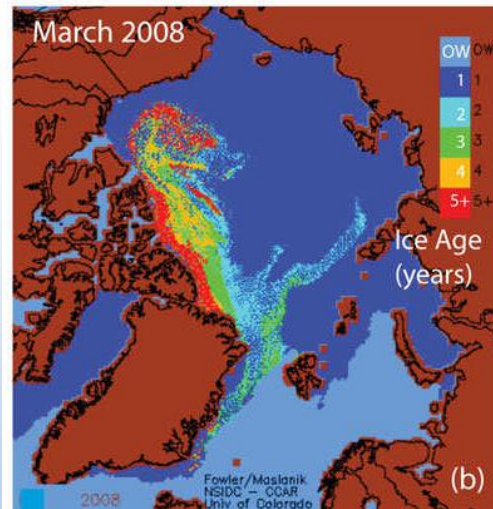
Ice Thickness Proxy

Old ice vs. Young ice
Multiyear vs. Seasonal
Thick ice vs. Thin ice



Young ice

Old ice

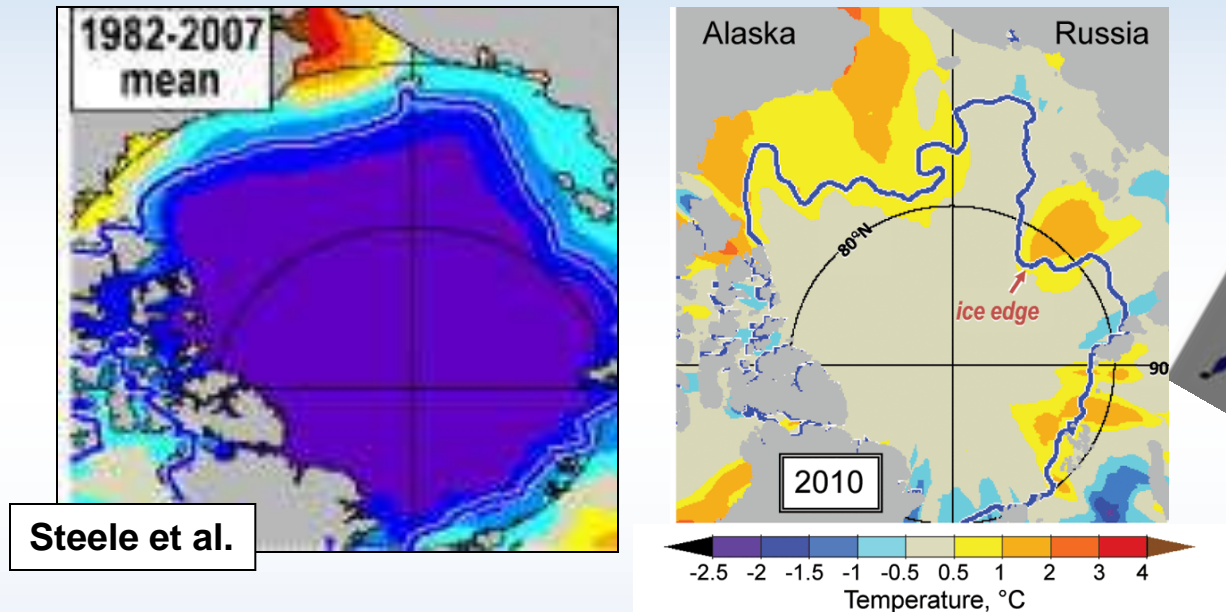


Maslanik &
Fowler

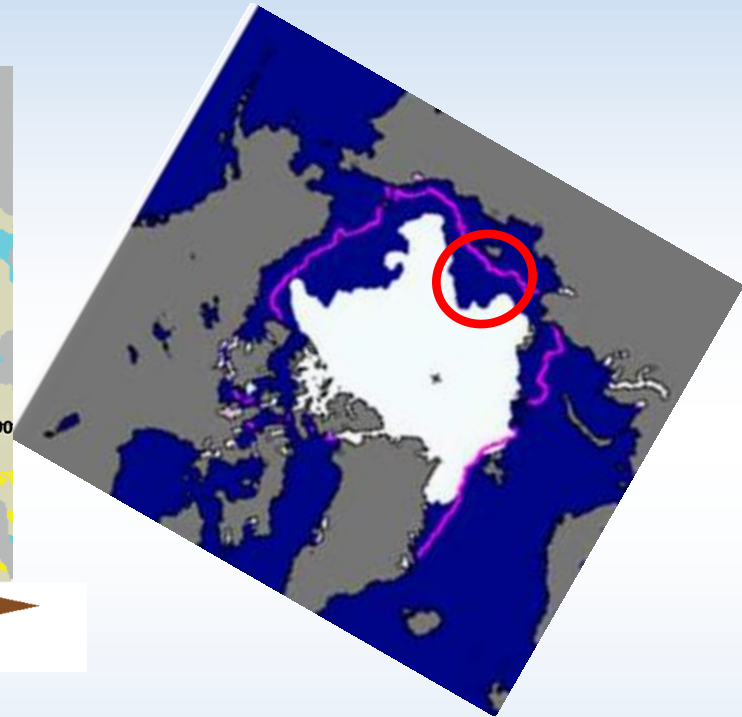
Dramatic loss of older, thicker ice

OCEAN

Sea Surface Temperature

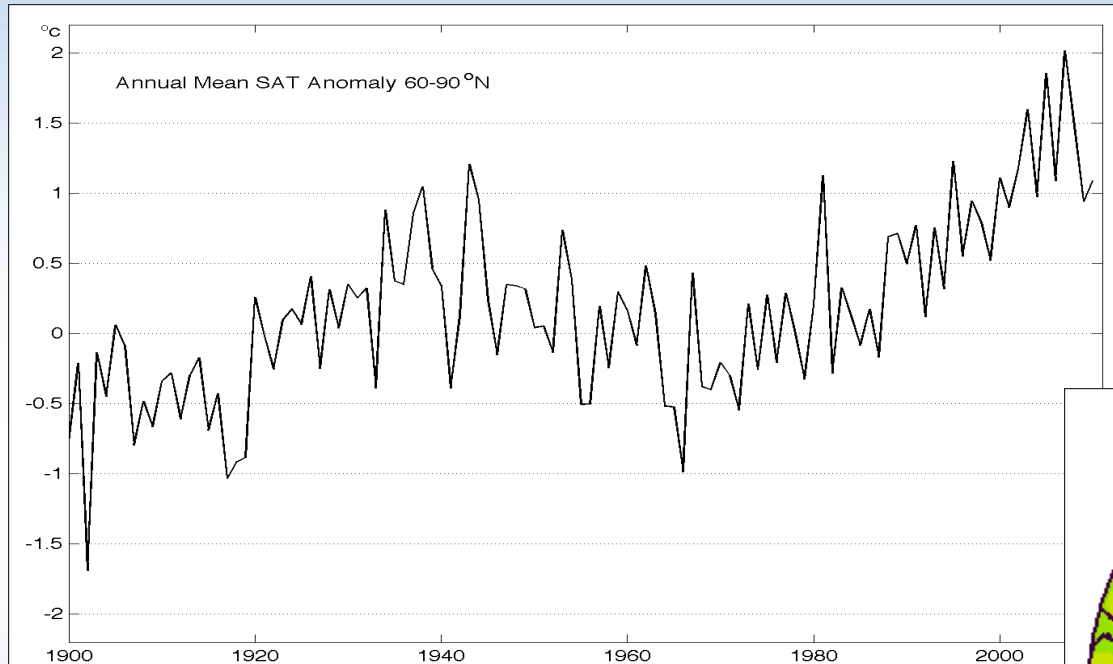


Steele et al.



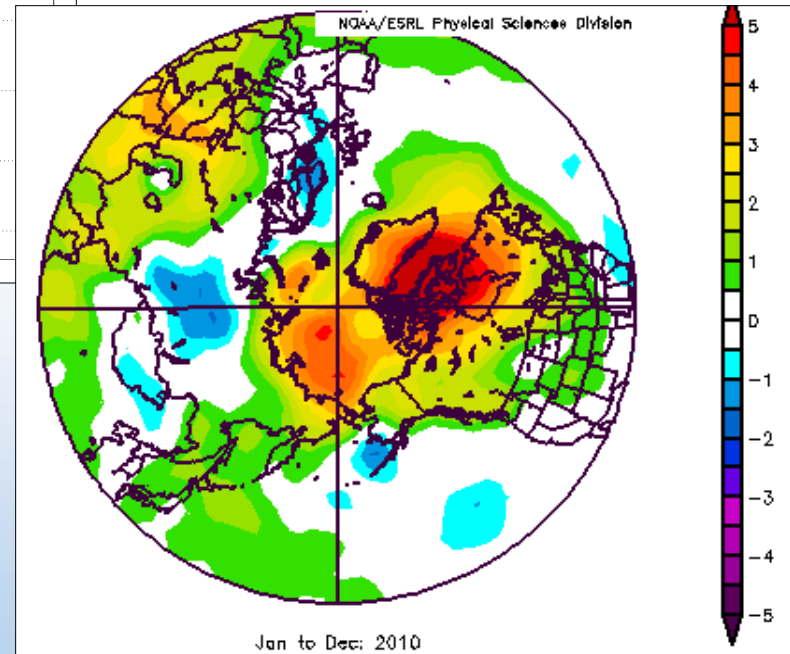
- **Pronounced warming since 1995**
- **Maximum change in marginal seas**
- **Corresponds to ice-free regions: Solar absorption**

ATMOSPHERE

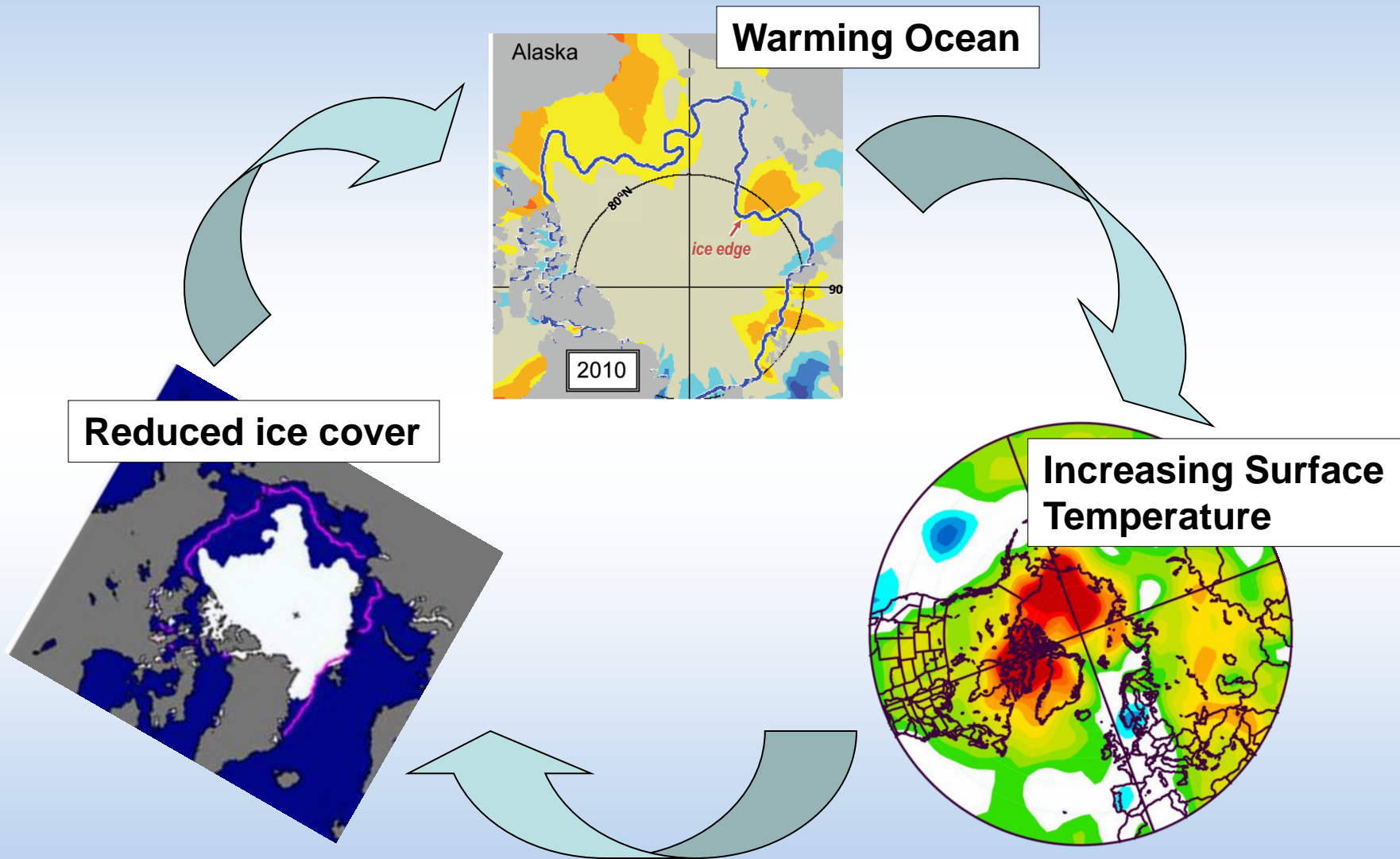


General increase in surface air temperature since the late 1960s.

- **Relatively high temperatures over the entire Arctic region.**
- **At least 2x greater than lower latitudes.**
- **Hot spots: Eastern Canada and western Greenland.**



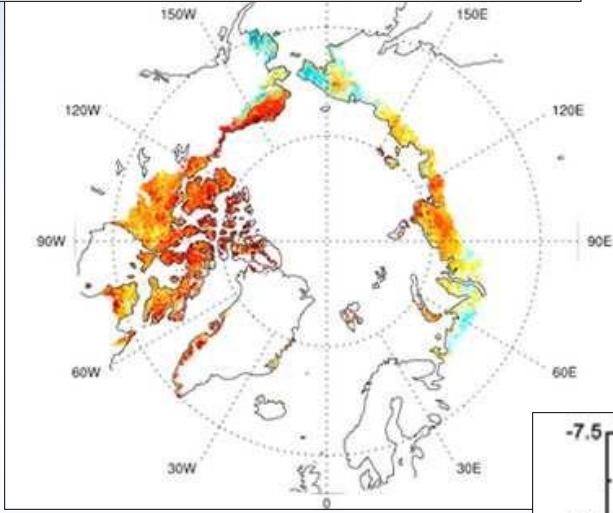
Arctic System



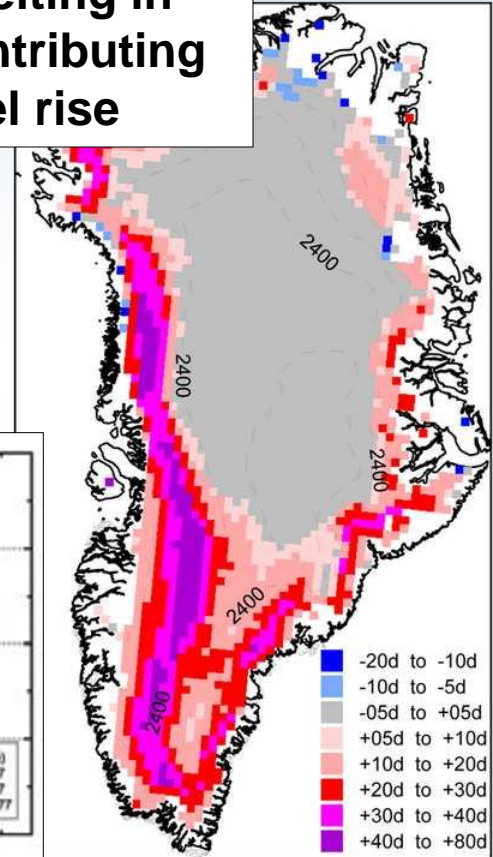
Compounding Impacts (Positive Feedback)

Arctic System

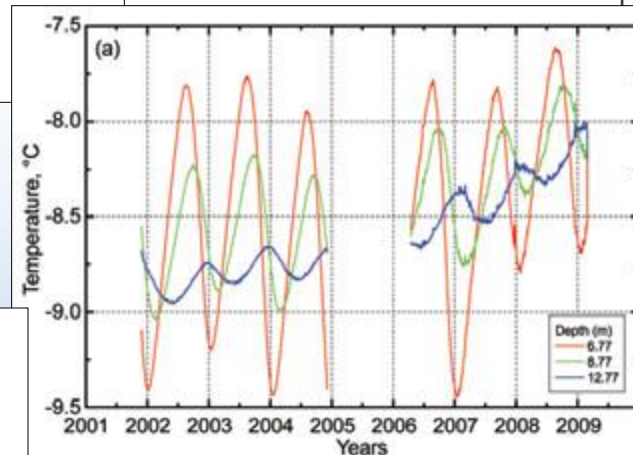
**Greening on land
correlated with sea ice loss**



**Increased melting in
Greenland contributing
to sea level rise**



**Warming permafrost,
most pronounced in
coastal regions**



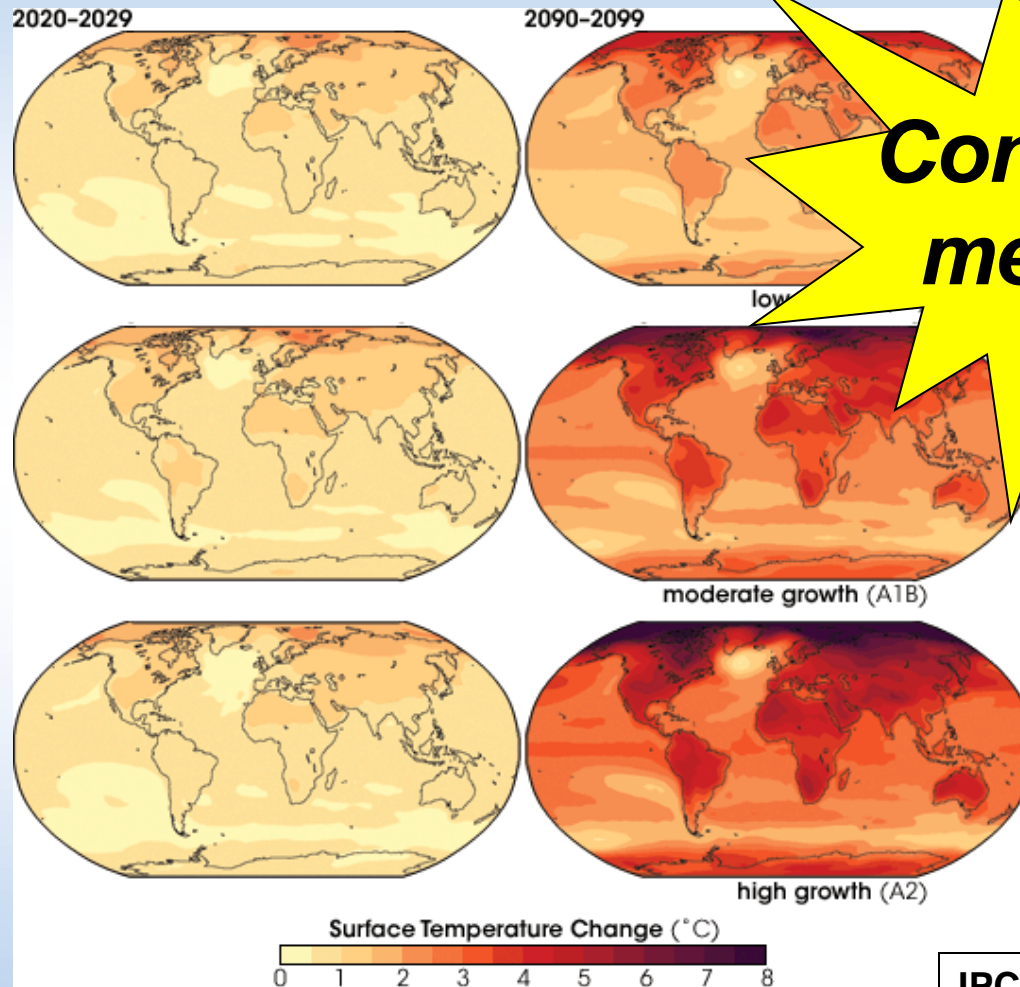
Widespread and convincing evidence of warming

The Road Ahead?



Nearly ice-free summers in the foreseeable future

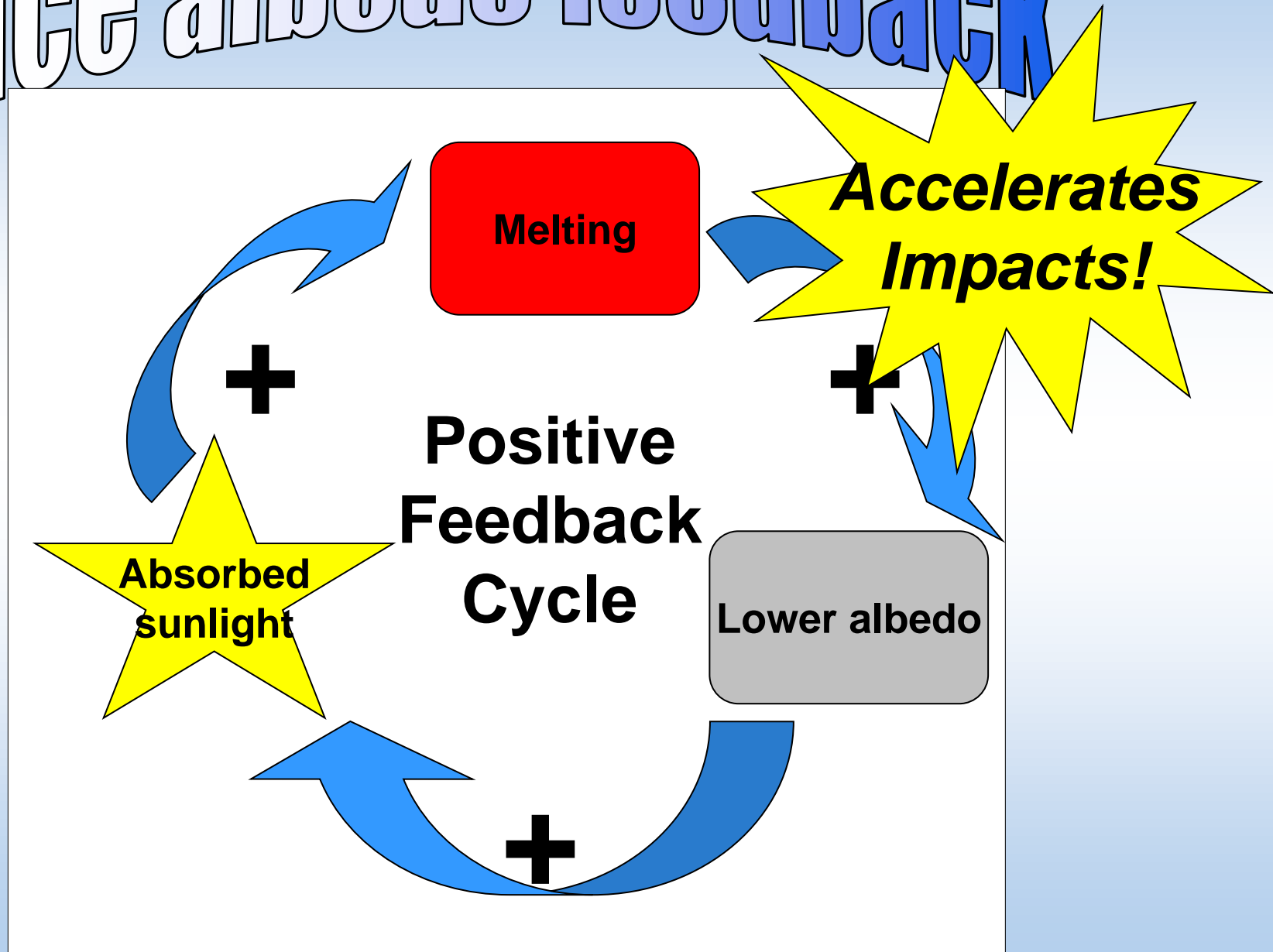
CONTINUED WARMING!



IPCC

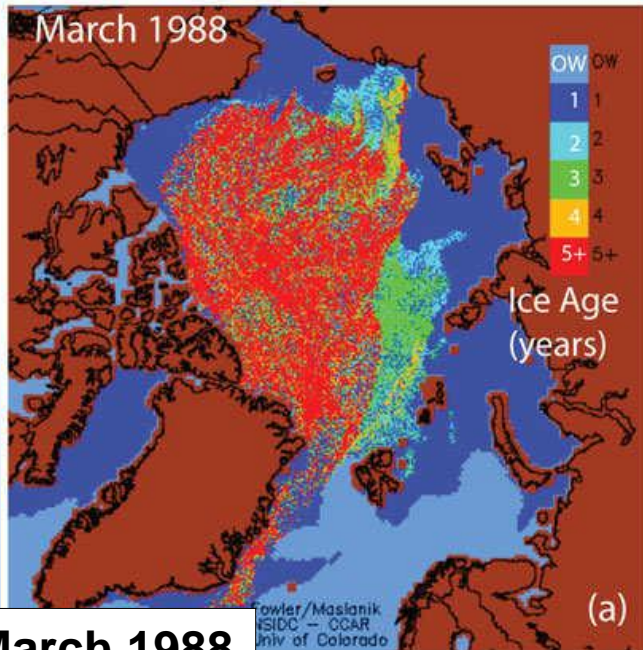
Projected increase of surface temperatures in Arctic: +4 to 8 ° C

Ice albedo feedback

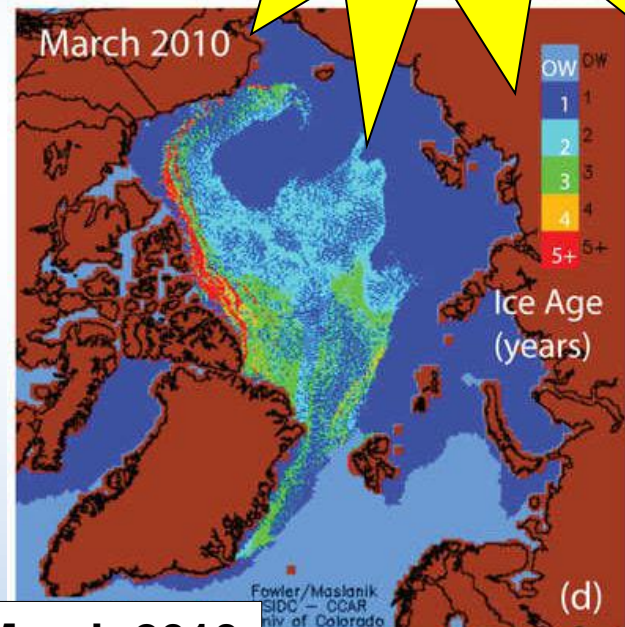
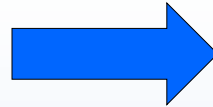


THINNING ICE COVER

***Vulnerable
to melting!***



March 1988



March 2010

A satellite map of the Arctic region, showing the Arctic Ocean and surrounding landmasses. The map is used as a background for the text.

KEY POINTS

- There is ample observation-based evidence that the Arctic is under stress due to climate warming.
- In view of projections of further warming, expect summer sea ice loss to continue.
- Change is occurring throughout the Arctic environmental system.
- Spreading the word is critical.

The Report Card is Changing Too



Arctic Report Card 2011 Update

Tracking recent environmental changes

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HOME

ATMOSPHERE

Weather patterns
Ozone & UV
Greenhouse Gases

OCEAN & SEA ICE

Sea Ice
Ocean Circulation
Ocean Temperature & Salinity
Ocean Acidification
Sea Level

MARINE ECOSYSTEMS

Primary productivity
Biodiversity
Biogeochemistry
Fisheries

TERRESTRIAL ECOSYSTEMS

Vegetation
Soil carbon
River biogeochemistry
Biodiversity

WATER, ICE & SNOW

Greenland
Glaciers & ice caps
Snow
Rivers & lakes
Permafrost

2011 in brief: A return to previous Arctic conditions is unlikely. Record high temperatures across Canadian Arctic and Greenland, a reduced summer sea ice cover, record snow cover decreases and links to some Northern Hemisphere weather support this conclusion

Arctic Report Card 2010



2011 by chapter

<p>Atmosphere ●</p> <p>Arctic climate is impacting mid-latitude weather, as seen in Winter 2009-2010</p>	<p>Marine Ecosystems ●</p> <p>Rapid environmental change threatens to disrupt current natural cycles</p>	<p>Changing?</p>  <p>Many indications of warming Consistent evidence of warming Little evidence of change</p>
<p>Ocean & Sea Ice ●</p> <p>Summer sea ice conditions for previous four years well below 1980s and 1990s</p>	<p>Terrestrial Ecosystems ●</p> <p>Low winter snow accumulation, warm spring temperatures lead to record low snow cover duration</p>	<p>Water, Ice & Snow ●</p> <p>Rapid environmental change threatens to disrupt current natural cycles</p>



• Independent peer review.

- New content, e.g., Ozone & UV, Greenhouse Gases, Ocean Acidification.
- Broaden the audience, particularly K-12, and increase effectiveness.
- Align with SEARCH and AON – an AON (& SAON) product/outcome.